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ABSTRACT

The National Science Foundation's (NSF's) institute programs and curriculum development activities are briefly reviewed as well as the current activities of the Information Dissemination for Science program. Included are goals of the program and a discussion of the nature of projects funded by the program. (DS)

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DISSEMINATION STRATEGIES AT THE NATIONAL SCIENCE FOUNDATION IN PRE-COLLEGE EDUCATION*

BY CHARLES W. WALLACE

In a report prepared by the Science Policy Research Division, Congressional Research Service of the Library of Congress[1] on pre-college science education during the first twenty-five years of the National Science Foundation, two programs received special praise for their accomplishments and value from the standpoint of national impact--the institute program and curriculum development.

Under the institute program, begun in the mid 1950's, NSF provided grant support to colleges and universities for faculty to instruct high school teachers in the sciences and mathematics directed toward the primary goal of increasing the effectiveness of these teachers by broadening and updating their scientific background. The first summer institute programs were patterned after industrial "institutes" for secondary school teachers supported in the 1940's and 50's by such industrial giants as General Electric, Westinghouse and Shell Oil. In addition to the summer institutes, usually of from 6 to 8 weeks in duration, Academic Year institutes and In-Service institutes were offered. The Academic Year institutes were often designed as part of an advanced degree program for teachers on leave from their regular employment while the In-Service institutes offered instruction during the school year during non-school hours. As the programs evolved during the 1960's the content was expanded to include the social sciences and the grade level was expanded to include elementary school teachers in addition to those from secondary schools. James Conant in his 1963 study of pre-college education said of the impact of these NSF institutes:

"The use of summer institutes for bringing teachers up to date in a subject-matter field has been perhaps the single most important improvement in recent years in the training of secondary school teachers."[2]

Similar views were expressed in 1965 by then United States Commissioner of Education Francis Keppel:

"The challenges are being met, and the institutes programs administered by the National Science Foundation have made a major contribution to our success. Through these institutes, teachers have become familiar with recent advances in their special fields of knowledge. They have familiarized themselves with new courses of study. They have developed new approaches to learning and teaching--benefitting not only themselves and their students but inspiring their

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fellow teachers as well. Beyond these accomplishments, the NSF institutes program has demonstrated that Federal efforts can produce substantial educational improvement. Its success has led to the development of similar institutes in other subject fields and it has taught the important lesson that the quality of education in the classroom is amenable to swift improvement by concentrating on the competence of the classroom's centrally important figure--the teacher."[3]

The second major program activity has been curriculum development. Foundation staff concluded that teacher training would be of little avail if teachers were constrained to use outmoded curricula. Many eminent scientists, mathematicians and educators have worked under NSF support to upgrade instruction and to provide new and scientifically accurate curricula for use in elementary and secondary school classrooms.

The first such effort was begun with a grant in November 1956 to the Massachusetts Institute of Technology to support the work of the Physical Science Study Committee (PSSC) under the direction of Dr. Jerrold R. Zacharias a well known physicist. The PSSC award became an historic model for major curriculum development. The project involved the collaboration of high school teachers with scholars and experts from higher education that resulted in a widespread change in high school physics teaching. In retrospect the project tended to be elitist in concept and result. It provided a high quality of physics education for those students already self-selected toward a high-powered course.

Major curriculum projects in secondary school biology, chemistry, mathematics and earth science followed soon after the PSSC award and using its model as the point of departure. Later these curriculum projects were expanded in scope to include both the social sciences and the elementary school level.

It soon became apparent that the teaching materials being developed represented such a radical departure from what had been in use that even teachers well prepared, in a conventional sense, needed additional training if they successfully were to handle these new course materials. The use of institutes as a strategy for training teachers in the use of the newly developed curricular materials become a major goal, along with the content background improvement of teachers, of many of the institute programs during the 1960's. It should be noted that in attending these institute programs, teachers were in no way coerced into installing one of the newly developed courses in their classroom.

While the institute programs continued to place emphasis on the betterment of the individual teacher, new strategies were developed to aid school systems to adopt the new curriculu materials. The Cooperative College - School Science program (CCSS) involved collaborative efforts of college faculty and local school system personnel to install curriculum materials into classrooms. This mechanism proved to be particularly effective in assisting elementary school personnel to use such science curricula as Elementary Science Study (ESS), Science Curricula Improvement Study (SCIS) and Science - A Process Approach (SAPA). The bulk of the elementary proposals received a decade ago were for projects aimed at the implementation of NSF-supported curricula materials. This was not true of the secondary school proposals, many of which requested support for non-NSF curricula and locally-generated materials.

With the increased focus on curriculum implementation and the improvement of instruction in the classroom, especially in the elementary school, new strategies were tried which entailed forming closer linkages between teachers, their support system of principals and supervisors, the curriculum developers and the Foundation.

Attention to implementation problems associated with elementary curricula culminated in an NSF-supported conference held at the University of Maryland in January 1967. Two new mechanisms for dissemination grew out of this conference--Administrators Conferences and Resource Personnel Workshops. The administrators conferences attempted to create awareness opportunities for school principals and supervisors to became acquainted with a selection of science, mathematics and social science curricula which might eventually be used in their schools or school districts. In the Resource Personnel Workshops key resource people, in some cases as individuals, in other cases as teams, were trained to advise and assist schools interested in adopting new curricula. The trainees were scientists, mathematicians and educators drawn from colleges and universities, former members of curricula study groups, school supervisors and principals, and teachers with a demonstrated interest in elementary education. The training opportunities were offered primarily to those expected to train others (multiplier effect) rather than to those involved only in teaching their own classes.

The 1960's and early 1970's, with the institutes and curriculum development programs operating at full-tilt, represented a "golden age" for pre-college science education at the National Science Foundation. One strategy in operation during this period that should not be overlooked in surveying dissemination activity at the Foundation was the policy which permitted publishers of the curriculum projects a limited copyright, usually of from five to seven years, for exclusive publication of the materials before they became subject to the conditions of public domain. While other federal agencies were funding the production of instructional materials in a number of curriculum areas such as reading and language, none had the success of NSF in getting these materials into the commerical market place.

In the spring of 1975, NSF's pre-college education activities attracted considerable attention in consequence of material contained in the social science curriculum Man: A Course of Study (MACOS). MACOS, designed as a fifth grade program, was developed with NSF support starting in 1964. Those persons objecting to MACOS expressed concern that the National Science Foundation was developing objectionable curricula and that the Federal government was promoting the use of MACOS and other Federally sponsored curricular through the NSF implementation programs. The criticism of MACOS received considerable discussion in Congress and eventually resulted in the suspension of institute and implementation type programs in the 1976 fiscal year, a time when curriculum development projects were also curtailed.

In the 1977 fiscal year budget Congress reinstated a number of the suspended programs but with considerable modifications. The Pre-College Teacher Development program marked the return to summer and in-service type institute programs, now having again a primary focus on the improvement of the subject matter content of the teachers being trained. These programs show a close kinship to the goals of institutes of the late 1950's and early 1960's. With the creation of the Department of Education in 1980, the early elementary school activity of this program was transferred to the new department.

The Information Dissemination for Science Education program represents to some degree a reincarnation of the Administrators Conferences of the late 1960's and early 1970's. The Information Dissemination program is concerned with bridging the gap existing between educational product developers and users, and is directed toward science education at the elementary and secondary school levels. The last decade has witnessed a proliferation in the development of new materials, practices and technologies available for use in elementary and secondary schools. The rapid pace at which these materials have been produced has made it difficult for those concerned with science education to carefully examine and evaluate alternatives. The Information Dissemination program provides opportunities for educational decision-makers such as administrators, subject matter specialists, teacher-leaders, school board members, representatives of parent groups, and other policymakers to make more informed choices. The dissemination program activities are primarily aimed at assisting state and local authorities to acquire information in three general areas--curriculum and instructional materials, use of new instructional technologies, and recent research findings particularly regarding cognition in science and mathematics learning.

Using the definition of dissemination developed in the 1977 report of the Dissemination Analysis Group on Dissemination in Relation to Elementary and Secondary Education, the program limits activity to the Spread, Exchange, and Choice levels of involvement.[4] To assuage Congressional concerns, direct Implementation, or the installation and utilization of specific curricular materials has been purposefully avoided in the program.

In preparing a proposal for possible support, writers must prepare a needs statement in which a rational for the specific dissemination activity is described. Since the individual project is often concerned with the dissemination of information on a range of alternatives, it is requested that a balanced perspective be presented in the discussion of such characteristics as design features, intended users, expected costs, advantages and disadvantages, and other relevant bits of information. In dealing with curricula and instructional materials it is required that evidence be presented documenting the scientific accuracy, the educational soundness, the anticipated outcomes, and associated costs of using the materials. One of the criteria used by proposal reviewers in their evaluation deals with the adequacy of the evidence presented in this documentation.

While the institute projects have almost exclusively been funded to colleges and universities, the information dissemination program in addition to these institutions has made awards to professional associations and societies, state education departments, intermediate school districts, and a number of local school districts. The conference, or series of conferences, usually from a single day to two weeks in duration, is the most common dissemination mode. A number of projects, however, have used media such as print, T.V.-video-videodisc, and computerized exchanges as the mode of dissemination.

The content to be disseminated, mentioned in the proposals received, has covered a very broad spectrum of education in the sciences, mathematics and social sciences--from safety in the laboratory to mathematics courses in American Indian reservation schools. Proposal pressure in the past two years has shown a decrease in requests centered on specific curricular materials; in its place has come a marked growth in proposals dealing with marine biology, a resurgence in the social studies area of the study of geography, and in mathematics the use of the microcomputer in the classroom. The Foundation has itself stimulated additional interest in proposals specifically concerned with adolescent students and in overcoming career barriers in the sciences and mathematics for females, members of minority groups and the handicapped.

The impact of NSF pre-college dissemination activities has been difficult to access. Much of the curriculum development activity of the late 1950's and 1960's was an attempt to produce both new and different models of curricula which it was hoped would spark similar commercial innovations. From this point of view perhaps the most successful of all curriculum development projects was the School Mathematics Study Group (SMSG) directed between 1958 and 1972 by Dr. E. G. Begle of Yale and Stanford Universities. Although the study never resulted in a final hard copy, textbook series, the materials produced stimulated subsequent changes in the elementary and secondary schools mathematics textbook series of almost all the commercial publishers during the 1960's and early 1970's. The SMSG materials prove to be the exception; most of the development projects resulted in having the curriculum materials published and distributed through commercial firms involved in the publication industry. In the highlights report by Dr. Iris R. Weiss[5] of school district use of NSF curriculum projects, surveyed during the 1976-77 school year, she discovered that while in elementary schools only 31% were using one or more of the science curricula developed with Foundation support, 60% of the secondary schools were using such curricula.

The Information Dissemination program has as its primary goal the creation of awareness, on the part of school decision-makers, of materials, concepts, techniques, technologies and research finds which might be of value to the pupils in their schools. As an evaluation criteria in measuring awareness, project directors have often used the spin-off influence of project participants spreading the information received to local audiences within their own and neighboring school districts. Using this second generation factor across the projects conducted, it seems that for each participant trained the information is spread to ten additional educators.

Programs in pre-college science education at the National Science Foundation currently assist in expanding the subject matter content background of the teacher through the Pre-College Teacher Development in Science Program; the Information Dissemination Program can create an awareness on the part of the school decision-makers as to the availability of materials for use in assisting pupil learning. However, at this time the Foundation supports no programs that directly impact on science and mathematics instruction in the classroom; this is a serious omission. One curricula, the Individualized Science Instructional System (ISIS), developed with NSF funding, has worked its way through the JDRP and into the NDN system as a means of assisting implementation into classrooms.

The Information Dissemination for Science Education program is at a crossroads. Pressure groups, both internal and external to the Foundation, have requested the reorganization and expansion of the program to cover not only pre-college science education but also higher education level dissemination in the sciences and engineering. Hopefully, the future direction of dissemination activities at the National Science Foundation will have as large a payoff in terms of improving the quality of American education in the natural sciences, the social sciences and mathematics and has those activities over the past quarter century.

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